RESEARCH BULLETIN 1013 MAY 1968

Macerated, Dewatered vs. Wilted Alfalfa-Grass Silage for Dairy Cows

J. W. HIBBS

H. R. CONRAD

W. H. JOHNSON

OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER
Wooster, Ohio

CONTENTS

* * *

AGDEX 121-410/51

5-68 2 5M

Macerated, Dewatered vs. Wilted Alfalfa-Grass Silage for Dairy Cows

J. W. HIBBS, H. R. CONRAD and W. H. JOHNSON

INTRODUCTION

As a part of efforts to make forage harvesting more independent of the weather, this study was conducted in cooperation with the developer[1] of an experimental machine designed to cut forage from the standing position, macerate it, squeeze out part of the juice, and blow the forage into a self-unloading wagon. If proven practical, this dewatering machine would make it possible to lower the moisture content of the forage to be ensiled without wilting in the field. This would save time, expense, and help avoid excessive leakage of forage juices from the silo which often occurs when the crop is ensiled at less than 30% dry matter.

Comparisons of the dewatered silages, wilted silage (haylage), and hay from the same crop (alfalfa grass) were based on visual observations, chemical analyses, and feeding and digestion trials with lactating cows. The nutrient losses were evaluated in the expressed juice from the dewaterer, which was poured on the ground.

EXPERIMENTAL PROCEDURES AND RESULTS

Harvest Data

First Crop: The entire crop acreage to be used for this work, mostly alfalfa with some timothy and other grasses, was first harvested between May 17 and 20, 1966. It was ensiled but was not used in this experiment.

Second Crop: Beginning the week of June 20, the second crop was divided into three parts. One part, 9,384 lb. of dry matter, was ensiled in a 10x40-foot concrete stave silo after direct cutting and dewatering. The material sampled from the loads as it went into the silo averaged 23.9 percent dry matter and contained 18.2 percent protein on the dry matter basis. (Protein refers to total or crude protein except where designated otherwise in this report.)

[1]The authors gratefully acknowledge the support of Massey-Ferguson, Inc., in providing financial assistance, machinery, and personnel for its operation.

A second portion of this crop (8,741 lb. of dry matter) was wilted in the field to an average of 51.5 percent dry matter (load samples) and ensiled after chopping from the windrow. Protein content was 18.7 percent.

A third portion was dried in the windrow, baled (22,700 lb. baled weight), and held for the feeding trials. The protein content of the sampled bales was 15.3 percent. Hay was not made from the two subsequent crops.

Grab samples of the standing crop contained 19.6 percent dry matter, of which 21.2 percent was protein (Table 1). The juice from the dewaterer was found to have 10 percent dry matter (Table 2). The dry matter in the juice contained 33.1 percent protein. It was estimated (Table 2) that 26.4 percent of the dry matter and 41.1 percent of the protein contained in the standing crop was expressed in the juice. Based on the carotenoid content, which probably consisted of 85-90 percent beta carotene, the juice dry matter contained 835 IU of vitamin A equivalent/gm. (379,-090 units/lb.)

Third Crop: During the week of July 25, the crop was cut for the third time. Part of the crop, 9,716 lb. of dry matter, was dewatered and ensiled on top of the dewatered second crop. This material averaged 32.0 percent dry matter and 18.1 percent protein as it went into the silo. The remaining part (6,092 lb. of dry matter) was wilted in the field to 50.2 percent dry matter and ensiled. The protein content of the dry matter was 21.0 percent.

The standing crop averaged 27.2 percent dry mat- which contained 21.3 percent protein (Table 1). Prior to this cutting, the weather was extremely dry.

TABLE 1.—Composition of Standing Crop Compared to the Dewatered and Wilted Forage as Ensiled.

	Standing Crop		Dewatered Forage		Wilted Forage	
	Dry Matter	Protein	Dry Matter	Protein	Dry Matter	Protein
	(%)*	(%)*†	(%)†	(%)†‡	(%)‡	(%)†‡
2nd Crop (6/20/66)	19.6	21.2	29.9	18.2	51.5	18.7
3rd Crop (7/25/66)	27.2	21.3	32 0	18.1	50.2	21.0
4th Crop (9/7/66)	23.7	22.1	29.1	18 7	56.9	19.5

*Based on representative field sample cut approximately 2 inches above ground.
†Crude protein dry matter basis.
‡Based on representative load samples at the silo.

The juice from the dewaterer was 23.5 percent dry matter (Table 2). The dry matter in the juice contained 28.1 percent protein. It was estimated (Table 2) that 48.8 percent of the dry matter and 64.4 percent of the protein contained in the standing crop was expressed in the juice. Carotenoid determinations of the juice showed an average of 521 units of vitamin A equivalent/gm. of juice dry matter (236,-534 units/lb.).

Fourth Crop: During the week of September 7, the same fields were harvested for the fourth time. About half of the crop, 19,099 lb. of dry matter, was direct cut, dewatered, and ensiled on top of the third cutting. The dewatered material as it went into the silo contained 29.1 percent dry matter, of which 18.7 percent was protein (Table 1). The other part of the fourth crop (21,134 lb. of dry matter) was wilted in the windrow to 56.9 percent dry matter and ensiled on top of the wilted third cutting. The protein content of the dry matter as it went into the silo was 19.5 percent (Table 1). The dry matter of the standing crop was 23.7 percent and it contained 22.1 percent protein (Table 1). The juice from the dewaterer contained 17.5 percent dry matter (Table 2). The juice dry matter contained 29.2 percent protein. It was estimated (Table 2) that 34.4 percent of the dry matter and 45.4 percent of the protein in the standing crop was expressed in the juice. The dry matter of the juice contained 29.2 percent protein and 670 units of vitamin A equivalent/gm. (303,940 units/lb.), Table 2.

Table 1 shows the dry matter and protein content of all three standing crops (grap samples) vs. the material which went into the silos (load samples). A summary of the partition of 100 lb. of all three standing crops in the dewatering process is in Table 2.

TABLE 2.—Partition of 100 Lb. of Standing Crop in the Dewatering Process.

	2nd Cutting 6/20/66	3rd Cutting* 7/25/66	4th Cutting 9/7/66
Standing crop (lb.)	100	100	100
Dry matter (D.M.) in standing crop (%)	19 6	27.2	23.7
Protein in standing crop dry matter (%)	21.2	21.3	22.1
Protein in standing crop dry matter (lb.)†	4.16	5 79	5.24
Dewatered forage (lb.)	48.24	43 53	53.45
Dry matter in dewatered forage (%)	29.9	32 0	29.1
Dry matter in dewatered forage (lb.)	14 42	13 93	15.55
Protein in dewatered forage dry matter (%)	18 2	18 1	18.7
Protein in dewatered forage dry matter (lb.)†	2.62	2 52	2.91
Percent of total dry matter in dewatered forage (%)	73 6	51.2	65.6
Percent of total protein in dewatered forage (%)	63.0	43.5	55.5
Juice expressed from 100 lb. of standing crop (lb.)‡	51.76	56.47	46.55
Dry matter in juice (%)	10 0	23.5	17.5
Dry matter in juice (lb.)	5.18	13 27	8.15
Protein in juice dry matter (%)	33.1	28.1	29.2
Protein in juice dry matter (lb.)†	1.71	3 73	2.38
Percent of total water in the juice (%)	57.94	59.34	50.33
Percent of total dry matter in juice (%)	26.4	48 8	34.4
Percent of total protein in juice (%)	41.1	64.4	45.4
Value of total protein in 1 ton of juice dry matter ($)**	58.65	49 79	51.74
Vitamin A (equiv.)/lb. of juice dry matter (units)††	379,000	236,530	303,940
Vitamin A (equiv.) in juice from 100 lb of crop (units)	1,963,220	3,138,753	2,477,111

*Extremely dry weather preceded the 3rd cutting.

†It may be noted that the amount of protein in dewatered forage in the 2nd cutting (2.62 lb.) plus the amount of protein in the expressed juice (1.71 lb.) sums to 4.33 lb. rather than the 4 16 lb. for the standing crop. The difference between 4.33 and 4.16 is assignable to accumulative error accompanying sampling, dry matter, and nitrogen determination procedures.

‡Lb. of juice expressed from 100 lb. of standing crop calculated as follows:

X=lb. of juice expressed from 100 lb. of standing crop.
(100 —X)=lb. of dewatered forage from 100 lb. of standing crop.
100 • % D.M.=lb. of dry matter in the standing crop.
lb. D.M. in standing crop=Dry matter in juice + dry matter in the dewatered forage.
∴ 100 : D.M. in standing crop=(% dry matter in the juice • X) + [(D.M. % in dewatered forage) • (100 —X)].

Using values for the second crop:
100 lb. • 19.6% D.M.=(10% D.M. • X) + (29.9% D.M. • (100 —X)).
X=10.3/.199=51.76 lb. of juice expressed from 100 lb. of standing 2nd crop.

**1 lb. of total protein is worth $ 0886 (based on the value of 1 lb. of digestible protein, $.10743, when 44% soybean meal is worth $95/ton). Percent digestible protein=(% total (crude) protein x .93) —3.5. (J. Dairy Sci. 42: 567. 1959.)

††1 mg. β carotene=1667 IU of vitamin A for rat growth (400 IU for cattle); carotene in standing crop and fresh dewatered forage was not measured.

Feeding Trials (Lactating Cows)

On October 1, 1966, the two silos, one containing dewatered silage and the other wilted silage, were opened at the top and fed to one of two groups of lactating cows. Each group consisted of five Holsteins and one Jersey cow.

The cows in Group 1 were fed the fourth cutting dewatered silage from October 1 to November 3, 1966, when they were switched to the other silo containing fourth cutting wilted silage. Group 1 cows were fed wilted silage down through the third cutting and about halfway through the second cutting, when they were switched back to dewatered silage on January 12, 1967. The amount of third cutting was too small to make a meaningful switchback.

The cows in Group 2 were fed fourth cutting wilted silage from October 1 to November 3, 1966, when they were switched to dewatered silage at a point approximately halfway through the fourth cutting layer. Feeding dewatered silage continued through the third cutting and about halfway through the second cutting, when Group 2 was switched back to wilted silage on January 12, 1967. Approximately 20 lb. of grain concentrate per day was fed with the silage to all the cows in the experiment.

A similar group of six cows was fed the baled second crop hay free choice with approximately 20 lb. of grain per day between December 1, 1966, and January 31, 1967.

TABLE 3.—Feed Intake, Milk Production and Body Weight Changes During the Feeding Experiment.

Experimental Period 1966-67	Treatment	Wet Silage Fed/Day	Silage D.M.	Silage D.M. Fed/Day	Grain Fed/Day	Grain D.M.	Grain D.M. Fed/Day
		lb.	%	lb.	lb.	%	lb.
		Group 1					
10/1-11/3†	Dewatered	82.2	32.31	26.6	19.4	87.50	17.0
11/4-12/5†	Wilted	53.0	57.11	30.3	19.3	86.50	16.7
12/6-12/27‡	Wilted	56.2	53.93	30.3	19.3	87.03	16.8
12/28-1/11**	Wilted	53.7	55.44	29.8	19.3	87.52	16.9
1/12-1/31**	Dewatered	94.5	27.21	25.7	19.3	87.19	16.9
		Group 2					
10/1-11/3†	Wilted	51.3	61.22	31.5	19.4	87.50	17.0
11/4-12/5†	Dewatered	95.4	30.78	29.4	19.3	86.50	16.7
12/6-12/27‡	Dewatered	85.5	33.82	28.9	19.3	87.03	16.8
12/28-1/11**	Dewatered	91.5	28.06	25.7	19.3	87.52	16.9
1/12-1/31**	Wilted	53.3	50.42	26.9	19.3	87.19	16.9
		Group 3					
12/1-1/31**	Baled Hay	38.5	86.50	33.3	19.4	87.11	16.9

Experimental Period 1966-67	Treatment	Feed Refused	Refuse D.M.	Refuse D.M.	Total D.M. Consumed per Day	Av. Milk Prod. per Day (Actual)	Av. Milk Prod. per Day (4% FCM)	Av. Body Wt.
		lb.	%	lb.	lb.	lb.	lb.	lb.*
		Group 1						
10/1-11/3†	Dewatered	4.1	32.85	1.4	42.2	61.3	54.5	1223
11/4-12/5†	Wilted	6.0	57.50	3.4	43.6	55.3	51.9	1248
12/6-12/27‡	Wilted	3.2	51.13	1.7	45.5	51.7	49.9	1262
12/28-1/11**	Wilted	6.9	50.13	3.4	43.3	47.3	43.6	—
1/12-1/31**	Dewatered	6.2	27.75	1.7	40.8	44.7	41.5	1294
		Group 2						
10/1-11/3†	Wilted	6.5	63.40	4.1	44.3	60.0	55.4	1191
11/4-12/5†	Dewatered	8.0	34.25	2.7	43.4	57.9	53.0	1246
12/6-12/27‡	Dewatered	6.5	37.63	2.5	43.3	52.3	47.0	1240
12/28-1/11**	Dewatered	4.7	30.00	1.4	41.2	48.9	43.9	—
1/12-1/31**	Wilted	3.4	53 08	1.8	41.9	46.2	44.0	1264
		Group 3						
12/1-1/31**	Baled Hay	5.7	86.50	4.9	45.3	63.5	58.2	1278

*Average body weight on the 15th of each month.

†Fourth cutting.

‡Third cutting.

**Second cutting.

Table 3 is a summary of the average amounts of silage or hay and grain consumed per day during each experimental period, along with the average pounds of milk produced (actual and 4 percent FCM) and the body weight changes. The average milk production (actual) for the different experimental periods is shown in Figure 1.

Table 4 shows the chemical analyses (dry matter and protein) of the silages and hay sampled as fed during each experimental period.

Digestion Trial Data (Lactating Cows)

To further measure the feed value of these crops harvested by dewatering and ensiling vs. wilting and ensiling, a series of 7-day digestion and nitrogen balance trials was conducted while the silages were being fed to lactating Jersey cows. During the digestion trials, half of the cows were fed grain, 16 lb./day (air dry), with all the silage they would eat. The other half were fed only silage in order to more critically measure the actual digestibility of the silages.

In Table 5, the percent digestibility of dry matter, cellulose, and nitrogen in the silages and baled hay are shown for each cutting. The percent of feed nitrogen appearing in the milk is also shown.

DISCUSSION AND CONCLUSIONS

A comparison of the composition of the standing crops with the forages which went into the silos (Table 1) shows that the percent protein in the dry

TABLE 4.—Chemical Analyses of Silages and Hay as Fed.

Period 1966-67	Treatment	% Crude Protein*	% Protein N—*	% NPN*	Dry Matter %
		Group 1			
10/1-11/3†	Dewatered	18.67	10.72	7.95	32.31
11/4-12/5†	Wilted	18.89	11.64	7.25	57.11
12/6-12/27‡	Wilted	19.67	11.01	8.66	53.93
12/28-1/11††	Wilted	18.07	11.25	6.82	55.44
1/12-1/31††	Dewatered	17.86	10.96	6.90	27.21
		Group 2			
10/1-11/3†	Wilted	18.65	11.05	7.60	61.22
11/4-12/5†	Dewatered	19.63	11.89	7.74	30.78
12/6-12/27‡	Dewatered	19.37	13.12	6.25	33.82
12/28-1/11††	Dewatered	17.93	10.93	7.00	28.06
1/12-1/31††	Wilted	19.21	10.88	8.33	50.42
		Group 3			
12/1-1/31††	Baled Hay	15.28	—	—	86.50

Period 1966-67	Treatment	Vitamin A (Carotenoids) IU/lb.***	Vitamin A (Beta carotene)‡‡ IU/lb.*	% Loss in Column	Plasma** Carotenoids ugm/100 ml.	Plasma** Vitamin A ugm/100 ml.
		Group 1				
10/1-11/3†	Dewatered	133,332	64,916	51.3	435	16.4
11/4-12/5†	Wilted	56,925	36,185	38.8	458	16.5
12/6-12/27‡	Wilted	—	—	—	651	15.3
12/28-1/11††	Wilted	74,940	48,350	35.5	787	17.0
1/12-1/31††	Dewatered	152,051	85,750	43.6	827	17.0
		Group 2				
10/1-11/3†	Wilted	—	—	—	—	—
11/4-12/5†	Dewatered	—	—	—	—	—
12/6-12/27‡	Dewatered	—	—	—	505	16.9
12/28-1/11††	Dewatered	—	—	—	—	—
1/12-1/31††	Wilted	—	—	—	—	—
		Group 3				
12/1-1/31††	Baled Hay	16,039	9,059	43.5	498	16.0

†Fourth cutting.
‡Third cutting.
††Second cutting.
‡‡Chromatographic separation on a Ca_2HPO_4 column.
*Dry matter basis.
**Average of five Holsteins.
***1 mg. β carotene = 1667 IU of vitamin A for rat growth (400 IU for cattle).

matter of the dewatered forages averaged 3.2 percent less than the standing crops. In the wilting process, the percent protein difference between standing crop and wilted forage dry matter averaged 1.8 percent less and was more variable, presumably due to leaf loss caused by raking and from wind during chopping and loading. The uniform high quality of the original crops is reflected in the protein content of the dry matter in all three crops, which averaged 21.5 percent.

The nutritive losses in the plant juice expressed during the dewatering process are more clearly pointed out in Table 2, where a partition of 100 lb. of each standing crop during the dewatering process is presented. This table shows that the dry matter in the standing crop lost in the juice ranged from 26.4 percent to 48.8 percent (average 36.5 percent). The protein in the standing crop lost in the juice ranged from 41.1 percent to 64.4 percent (average 54.0 per-

TABLE 5.—Digestibility of Dry Matter, Cellulose, and Nitrogen and Feed Nitrogen Appearing in the Milk.

	Date Digestion Trial Started	Cow No.	Dry Matter Digestibility	Cellulose Digestibility	Nitrogen Digestibility	Feed Nitrogen in Milk
			%	%	%	%
		DEWATERED				
4th cutting	10/22/66	1525	59.91	61.35	65.33	19.42
Top of silo	10/22/66	1597*	63.89	60.73	66.26	23.81
	11/15/66	1705	59.73	56.56	65.53	18.31
	11/15/66	1631*	63.19	49.89	64.31	20.00
Average			61.68	57.13	65.36	20.39
3rd cutting	12/12/66	1705	53.41	55.03	61.91	16.27
		1631*	61.07	52.61	64.09	15.89
Average			57.24	53.82	63.00	16.08
2nd cutting	1/18/67	1525	60.99	59.29	63.32	20.69
		1597*	65.02	50.57	64.57	30.85
Average			63.01	54.93	63.95	25.77
All 3 cuttings - Fed grain (4)			63.29	53.45	64.81	25.14
All 3 cuttings - No grain (4)			58.51	58.06	64.02	18.67
Average all (8)			60.90	55.75	64.42	21.91
		WILTED				
4th cutting	10/22/66	1705	60.99	59.07	66.81	13.72
Top of silo	10/22/66	1631*	67.62	58.78	66.55	20.43
	11/15/66	1525	60.01	57.39	60.22	19.00
	11/15/66	1597*	78.35	68.91	62.47	25.40
Average			66.74	61.04	63.76	19.69
3rd cutting	12/12/66	1525	57.64	43.74	65.32	16.55
		1597*	63.93	47.06	65.69	19.73
Average			60.79	45.40	65.51	18.14
2nd cutting	1/18/67	1705	59.00	65.34	59.66	14.82
		1631*	60.25	60.62	57.25	19.03
Average			59.63	62.98	58.46	16.93
All 3 cuttings - Fed grain (4)			67.54	58.84	63.00	21.15
All 3 cuttings - No grain (4)			59.41	56.39	62.99	16.02
Average all (8)			63.48	57.61	63.00	18.59
		BALED HAY				
2nd cutting	12/12/66	1606	67.76	71.16	70.26	21.08
	12/12/66	1576*	65.79	65.51	66.23	26.10
	1/18/67	1606	63.66	69.95	66.40	17.61
	1/18/67	1576*	67.76	66.14	65.56	25.83
Average			66.24	68.19	67.11	22.66
Fed grain (2)			66.78	65.83	65.90	25.97
No grain (2)			65.71	70.56	68.33	19.35
Average all (4)			66.24	68.19	67.11	22.66

*Fed grain—16 lb./day.

cent.) The value of the protein lost in a ton of juice dry matter was estimated to range from $49.79 to $58.65 (average $53 39) based on the value of digestible protein in 44 percent soybean meal worth $95 per ton. In the above calculations, it was assumed that the samples of standing crop and dewatered forage were representative of the forage harvested. The vitamin A (equivalent) per pound of juice dry matter ranged from 236,530 IU to 379,000 (average 306,533 IU).

On the basis of the protein and carotene losses, considerable effort can be justified to salvage the expressed plant juices and recover these and other nutrients contained in them for use in animal feed supplements.

Wet weights of forage, weighed in and out of the silos, showed that there was an 11.5 percent loss from the dewatered silo compared to a 7.0 percent loss from the wilted silo. However, there was a considerable amount of spoilage (moldy silage) in the wilted silo—4,186 lb. (6.09 percent) rejected compared to only 168 lb. (0 13 percent) rejected from the dewatered silo. No external leakage from either silo was noted at any time.

In the feeding trial, the dewatered silage as supplemented in this experiment proved to be equal to the wilted silage for milk production (Table 3 and Figure 1) However, the dry matter digestibility of the dewatered silage was lower than the wilted silage (Table 5). It will be noted that the lowest dry mat-

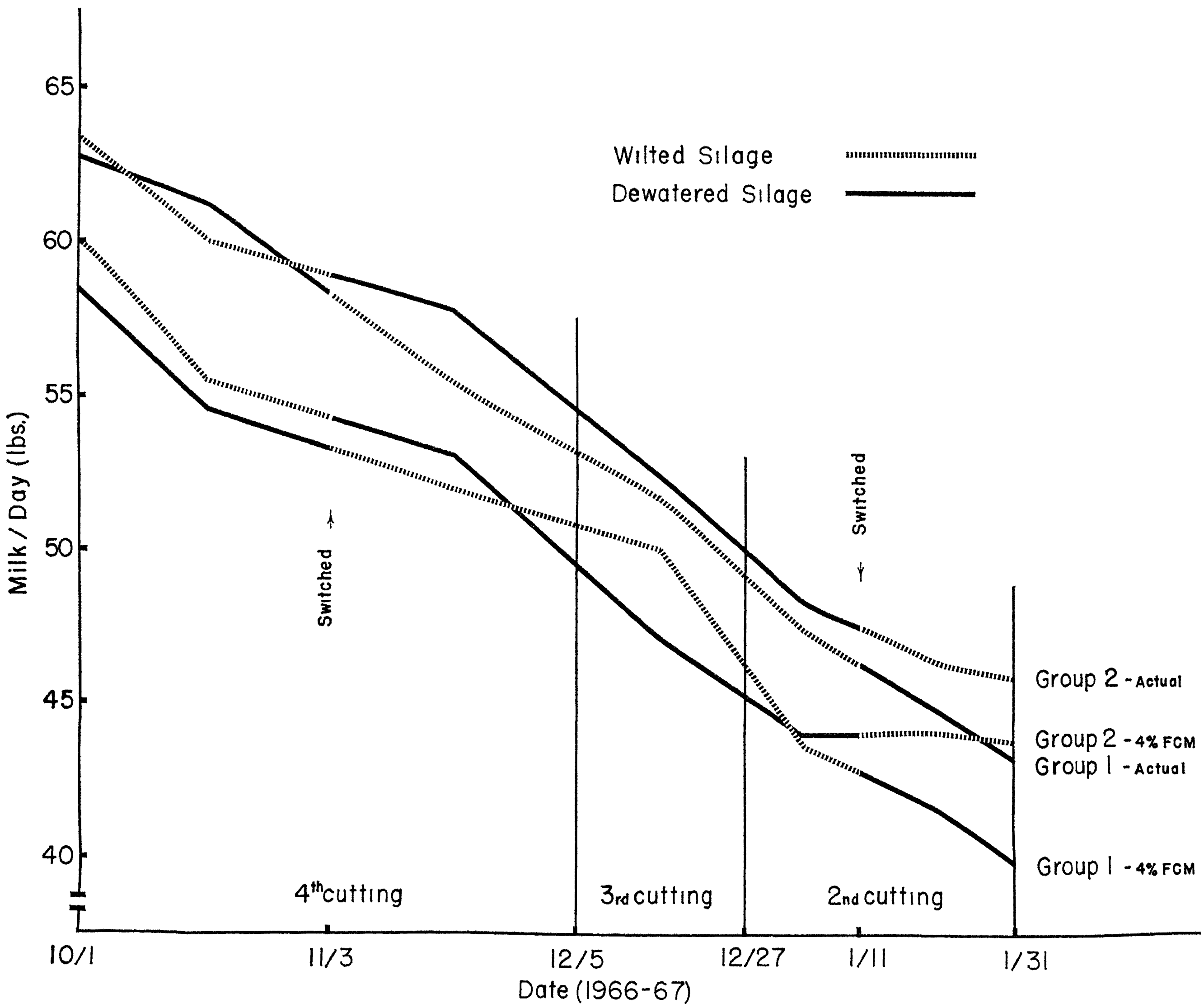

Fig. 1.—Average daily milk production (actual and 4% FCM) plotted at the middle of each experimental period. Analysis of variance of the switchback trials showed that the differences in milk production were no greater than would be expected due to random effects, except that 4 percent FCM in the dewatered silage fed group was significantly lower during the period when third cutting silage was fed.

ter digestibility occurred when third cutting dewatered silage was fed (57.24 percent). This was accompanied by a significant drop in 4 percent FCM during the period this silage was fed. No significant differences in milk production were found at any other point. The overall grain intake was the same for the cows fed each forage (16.9 lb. of grain dry matter per day, Table 3).

Forage dry matter intake of the cows fed dewatered silage (Table 3) averaged 25.3 lb./day (forage to grain ratio = 1.5:1), while the cows fed wilted silage averaged 26 8 lb /day (forage to grain ratio = 1.6:1). The cows fed dewatered silage ate an average of 1.5 lb./day less total dry matter (wilted 43 7 lb./day—dewatered 42 2 lb./day) and digested the ration dry matter and cellulose to a lesser extent (Table 5). However, they produced a similar amount of milk (Table 3). Thus the overall efficiency of utilization of the digested dry matter for milk production by the cows fed the dewatered forage was greater. Analysis of variance showed this difference to be significant ($P<0.01$). Owen and Howard (3) found a similar difference in efficiency due to silage moisture content. They showed that low moisture (wilted) silage required 80% more digestible energy per unit of milk than the high moisture silage.

The percent of feed nitrogen converted to milk nitrogen was greater for the cows fed the dewatered silage, indicating greater efficiency of nitrogen utilization than when wilted silage was fed (Table 5). Body weight increased similarly in both groups (Table 3) during the 123-day feeding trial period (Group 1—71 lb.; Group 2—73 lb.).

Digestibility of dry matter, cellulose, and protein by the cows fed baled hay from the second cutting was higher than either the dewatered or wilted silage (Table 5). Milk production of the group fed second cutting baled hay declined from 67.8 lb./day on December 1, 1966, to 57.8 lb./day on January 31, 1967. The slope of the lactation curve during this period was about the same as for the silage-fed cows shown in Figure 1. Average production for the period was 63.5 lb./day. However, this group was started later and at a higher average level of production than the silage-fed groups. They were fed the same amount of grain dry matter (16.9 lb./day) as the silage-fed cows and consumed an average of 28 4 lb. of hay/day (45.3 lb. of dry matter/day) excluding an average of 4.9 lb. of refuse/day (forage to grain ratio = 1.7:1), Table 3.

It was observed that the silage made from dewatered forage was more densely packed in the silo and was greener in color, compared to the wilted silage. This resulted in greater preservation of carotene in the dewatered silage, probably due to the greater exclusion of air (Table 4). Blood plasma levels of carotene and vitamin A in the cows fed the two silages were not greatly different. However, both groups of cows fed silage were higher in plasma carotene than the cows fed the baled hay from the second cutting (Table 4).

Baxter *et al.* (1) found no significant difference in feeding value of chopped alfalfa or orchardgrass forage further lacerated to an almost pulpy consistency, compared with the same forage chopped with a conventional forage chopper and ensiled in concrete stave tower silos.

Derbyshire *et al.* (2), working with the dewatering machine to reduce forage moisture prior to ensiling, compared first cutting alfalfa which was direct cut, windrow wilted, and mechanically dewatered. Respective dry matter recoveries from the silos were 77, 97, 87 percent. In 120-day feeding trials, silage dry matter consumption as percent of body weight was significantly greater when wilted silage was fed but FCM production was similar for the three silages. Rate of decline in FCM production was greater when wilted silage was fed (—45 gm /day) and least when dewatered silage was fed (+5 gm./day) during the experimental period. Rate of decline when direct cut silage was fed was —23 gm./day. Silage made by all three systems did not differ in digestibility of dry matter or cellular fractions.

The available evidence indicates that there are advantages in direct cutting over field wilting and that dewatering offers a way to reduce seepage losses from the silo and improve the quality of low dry matter silage by reducing the moisture content. However, in consideration of the nutrient losses in the expressed plant juices, the practicality of the dewatering machine would be greatly enhanced if a system could be developed to preserve the juice dry matter for use in animal feed supplements. The dewatering process eliminated an average of 55.9 percent of the water in the standing crop. If the expressed juice dry matter could be preserved, this process might find practical application as a preliminary step in the commercial dehydration of forages.

LITERATURE CITED

1. Baxter, H. D., J. R. Owen, and D. R. Waldo. 1966. Effect of laceration of chopped forage on preservation and feeding value of alfalfa-orchardgrass silage. J. Dairy Sci. 49: 1441.
2. Derbyshire, J. C., C. H. Gordon, and J. L. Humphrey. 1967. Silage quality and animal performance as affected by methods of reducing forage moisture. J. Dairy Sci. 50: 983.
3. Owen, F. G. and W. T. Howard. 1965. Effect of ration moisture level on value of alfalfa plus cracked corn as a complete-feed silage for lactating cows. J. Dairy Sci. 48: 1310.

The State Is the Campus for Agricultural Research and Development

Ohio's major soil types and climatic conditions are represented at the Research Center's 12 locations. Thus, Center scientists can make field tests under conditions similar to those encountered by Ohio farmers.

Research is conducted by 13 departments on more than 6200 acres at Center headquarters in Wooster, ten branches, and The Ohio State University.

Center Headquarters, Wooster, Wayne County: 1953 acres

Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres

Jackson Branch, Jackson, Jackson County: 344 acres

Mahoning County Farm, Canfield: 275 acres

Muck Crops Branch, Willard, Huron County: 15 acres

North Central Branch, Vickery, Erie County: 335 acres

Northwestern Branch, Hoytville, Wood County: 247 acres

Southeastern Branch, Carpenter, Meigs County: 330 acres

Southern Branch, Ripley, Brown County: 275 acres

Vegetable Crops Branch, Marietta, Washington County: 20 acres

Western Branch, South Charleston, Clark County: 428 acres